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Pesticide Fact Sheet Number 19: Aldicarb

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16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, Science Findings

b. Identifiers/Open-Ended Terms

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EPA Pesticide Fact Sheet

Name of Chemical: ALDICARB
Reason for Issuance:
Date Issued: March 30,1984
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1. DESCRIPTION OF CHEMICAL

Generic Name: 2-methyl-2-(methylthio) propionaldehyde O-(methylcarbamoyl) oxime

Common Name: Aldicarb

Trade Name: Temik®

EPA Shaughnessy Code: 098301

Chemical Abstracts Service (CAS) Number: 116-06-3

Year of Initial Registration: 1970

Pesticide Type: insecticide, acaricide and nematicide

Chemical Family: carbamate

U.S. and Foreign Producers: Union Carbide Corporation

2. USE PATTERNS AND FORMULATIONS

Application Sites and Rates:

Terrestrial Food Use

Sites	Rates (lbs. active ingredient)
Beans, dried	0.5 - 2.0
Cotton	0.3 - 6.0
Grapefruit	5.0 - 10.0
Lemons	5.0 - 10.0
Oranges	5.0 - 10.0
Peanuts	1.0 - 3.0
Pecans	0.7 - 10.0
Potatoes	1.0 - 3.0
Sorghum	0.5 - 1.0
Soybeans	0.7 - 3.0
Sugar beets	1.0 - 6.0
Sugar cane	2.0 - 3.0
Sweet potatoes	1.5 - 3.0

Terrestrial Non-Food Uses

Sites	Rates (lbs. active ingredient)
Birch	5.0 - 10.0
Dahlias	5.0 - 8.0
Holly	5.0 - 10.0
Lilies, bulbs	5.0 - 7.0
Roses	7.0 - 10.0

Commercial Greenhouse Uses

Sites	Rates (lbs. active ingredient)
Carnations	7.5 - 10.0
Chrysanthemum	7.5 - 10.0
Easter lilies	5.0 - 7.5
Gerbera	5.0 - 10.0
Orchids	7.5 - 10.0
Poinsettia	7.5 - 10.0
Roses	5.0 - 10.0
Snapdragons	5.0 - 10.0

Types of Formulations and Method of Application:

Aldicarb is a soil incorporated pesticide commercially formulated into a 15% granular formulation, two (2) 10% granular formulations and a 5% granular formulation in a mixture with the fungicides pentachloronitrobenzene and 5ethoxy-3-(trichloromethyl) 1,2,4-thiadiazole.

3. SCIENCE FINDINGS

Summary Science Statement:

Aldicarb has a high acute toxicity as an acetylcholinesterase inhibitor via the oral, inhalation and dermal routes of exposure. Neither aldicarb not its metabolites have been shown to be neurotoxic, oncogenic, teratogenic or mutagenic in studies that have been reviewed to date.

Aldicarb has been found to leach in fine to coarse textured soils, including those soils with a high organic matter content. The wide natural variability in soil types, weather patterns and aquifer characteristics make it impossible to specify a precise set of circumstances under which aldicarb will not reach ground water. In an effort to reduce further ground water contamination, stringent label/use restrictions have been established by the guidance document. An expedited "Special Review" of the aldicarb contamination problem is being initiated to determine whether aldicarb products can be labeled any practical way that would both permit the continued use of the chemical and preclude ground contamination of unacceptable amounts. Under this review we will also be determine what level will be acceptable in ground water. Aldicarb is highly toxic to wildlife organisms. From the available data, only limited exposure is expected to large animals, estuarine/ marine organisms and freshwater organisms as a result of the current label uses. Data suggest that application of this pesticide may result in some mortality to certain avian species. Additional data are being required to fully assess the impact on avian and small mammal populations.

Chemical Characteristics:

Technical aldicarb is a white crystalline solid with a melting point of 98-100° C (pure material). Under normal conditions, aldicarb is a heat-sensitive, inherently unstable chemical and

must be stabilized to obtain a practical shelf-life.

Toxicology Characteristics:

Aldicarb is a carbamate insecticide which causes cholinesterase inhibition (ChE) at very low exposure levels. It is highly toxic by the oral, dermal and inhalation routes of exposure (Toxicity Category I). The oral LD_{50} value for technical aldicarb is 0.9 mg/kg and 1.0 mg/kg for male and female rats, respectively.

The acute dermal LD_{50} for aldicarb in rats is 3.0 mg for males and 2.5 mg for females. High mortality was evident in rats, mice and guinea pigs (6.7 mg/M^3), a 15 minute exposure period was not lethal; however, 5 of the 6 test animals died during a 30-minute exposure. Exposure of rats for eight hours to air that had passed over technical aldicarb or granular aldicarb produced no mortality. Aldicarb applied to the eye of rabbits at 100 mg of dry powder caused ChE effects and lethality.

The toxicity data base for aldicarb is nearly complete; however, additional mutagenicity tests are being required by the aldicarb guidance document. The toxicity data base includes a 2-year rat feeding/oncogenicity study with a no-observed effect level (NOEL) of 0.3 mg/kg bw/day for effects other than cholinesterase inhibition and was negative for oncogenic effects at the level tested (0.3 mg/kg bw/day); a 2-year rat oncogenicity study which was negative for oncogenic effects at the levels tested (0.1 and 0.3 mg/kg bw/day); a 100-day dog feeding study and a 2-year dog

feeding study with NOELs of 0.7 and 0.1 mg/kg bw/day, respectively, for effects other than cholinesterase inhibition (highest levels tested (HLT)); an 18-month mouse feeding/oncogenicity study with a NOEL of 0.7 mg/kg bw/day and was negative for oncogenic effects at the levels tested (0.1, 0.3 and 0.7 mg/kg bw/day); a 2-year mouse oncogenicity study which was negative for oncogenic effects at the levels tested (0.3 and 0.9 mg/kg bw/day); a 6-month rat feeding study using aldicarb sulfoxide with a NOEL of 0.125 mg/kg bw/day for cholinesterase inhibition; a 3-generation rat reproduction study with a 0.7 mg/kg bw/day NOEL; a rat teratology study which was negative for teratogenic effects at 1.0 mg/kg bw/day (HLT); a rabbit teratology study which was negative for teratogenic effects at 0.5 mg/kg bw/day (HLT); and a hen neurotoxicity study which was negative at up to 4.5 mg/kg bw/day.

Physiological and Biochemical Behavior Characteristics:

Aldicarb and its metabolites are absorbed by plants from the soil and translocated into the roots, stems, leaves and fruit. The available data indicate that the metabolism of aldicarb in plants and small animals are similar.

Aldicarb is metabolized rapidly by oxidation to the sulfoxide metabolite and followed by slower oxidation to the sulfone metabolite. Both the sulfoxide and sulfone are subsequently hydrolyzed and degraded further to yield less toxic entities. Sufficient information is not available to adequately define the metabolism of aldicarb in ruminant animals. However, at

present the major residues of concern in plants and animals appear to be the parent compound aldicarb and its sulfoxide and sulfone metabolites.

Environmental Characteristics:

Sufficient data are not available to fully assess the environmental fate of aldicarb. Additional data are being required on soil metabolism, soil and aquatic dissipation, leaching and volatility. However, from the available data, aldicarb has been determined to be mobile in fine to coarse textured soils, even including those soils with high organic matter content and may reach ground water. Aldicarb is not expected to move horizontally from a bare, sloping field. Therefore, accumulation of aldicarb in aquatic nontarget organisms is expected to be minimal. This is further supported by an octanol/water partition coefficient of 5 and an ecological magnification value of 42.

Ecological Characteristics:

Aldicarb is highly toxic to mammals, birds, estuarine/marine organisms and freshwater organisms. LC_{50} values for the bluegill sunfish and rainbow trout have been reported as 50 ug/liter and 560 ug/liter, respectively. A LC_{50} of 410.7 ug/liter was reported for the Daphnia magna. Studies on the toxicity of aldicarb to the mallard duck and bobwhite quail indicate LD_{50} values of 1.0 and 2.0 mg/kg, respectively.

Limited exposure to mammals is expected from a dietary standpoint. However, data from field studies and the use history

of aldicarb provide sufficient information to suggest that application of this pesticide may result in some mortality, if not local population reductions of certain avian species. Whether these effects are excessive, long lasting, or likely to diminish wildlife resources cannot be stated with any degree of certainty. Therefore, additional field studies are being required to further quantify the impact on avian and small mammal populations.

Aldicarb has also been found to pose a threat to the endangered species, Attwater's Greater Prairie Chicken, residing in or near aldicarb treated fields. Accordingly, all aldicarb products are required to bear labeling restrictions prohibiting the use of the product in the Texas counties of Aransas, Austin, Brazoria, Colorado, Galveston, Goliad, Harris, Refugio and Victoria if the Attwater's Greater Prairie Chicken is located in or immediately adjacent to the treatment area.

Tolerance Assessments:

The Agency is unable to complete a full tolerance assessment of aldicarb tolerances at this time because of the lack of 1) a large animal metabolism study which adequately identifies and quantifies residues in tissue; 2) analyses of treated cotton foliage and; 3) processing studies for instant coffee, potato granules and dried potatoes and soybean processing fractions. Additionally, there are some concerns over the appropriate Acceptable Daily Intake (ADI) for aldicarb.

In 1983, the Assistant Administrator for the EPA formed an Aldicarb Review Committee to evaluate the available toxicity data for aldicarb and determine the appropriate ADI. A formal report is not available at this time; however, one of the suggestions of the committee was the use of an "intermediate uncertainty factor of 32". The resulting ADI, if adopted, would be 0.0038 mg/kg/day. An independent evaluation of the toxicity data base by the World Health Organization (1982) and the Institute for Comparative and Environmental Toxicology (Cornell University) further supports the ADI used by the Office of Pesticide Programs (OPP). Although there has been and continues to be much discussion on the subject, the OPP considers it prudent, at this time, not to alter its established ADI of 0.003 mg/kg/day.

Based on the below listed tolerances for aldicarb and its sulfoxide and sulfone metabolites, the current theoretical maximum residue contribution (TMRC) is 0.1120 mg/day for a 1.5 kg diet which utilizes 62.14 percent of the ADI.

Tolerances for Residues

Raw Agricultural Commodities	Parts Per Million
Bananas	0.3
Beans (dry)	0.1
Beets, sugar	0.05
Beets, sugar, tops	1.0
Cattle, fat	0.01
Cattle, mbyp	0.01
Cattle, meat	0.01
Coffee beans	0.1
Cottonseed	0.1

Tolerances for Residues (cont.)

Raw Agricultural Commodities	Parts Per Million
Goats, fat	0.01
Goats, mbyp	0.01
Goats, meat	0.01
Grapefruits	0.3
Hogs, fat	0.01
Hogs, mbyp	0.01
Hogs, meat	0.01
Horses, fat	0.01
Horses, mbyp	0.01
Horses, meat	0.01
Lemons	0.3
Limes	0.3
Milk	0.002
Oranges	0.3
Peanuts	0.05
Peanut, hulls	0.5
Pecans	0.5
Potatoes	1.0
Sheep, fat	0.01
Sheep, mbyp	0.01
Sheep, meat	0.01
Sorghum, fodder	0.5
Sorghum, grain	0.2
Soybeans	0.02
Sugarcane	0.02
Sugarcane, fodder	0.1
Sugarcane, forage	0.1
Sweet potatoes	0.1

Problems Which are Known to Have Occurred With Use of Aldicarb:

In 1979, aldicarb residues were found in drinking water wells located near aldicarb treated potato fields in Suffolk County, Long Island, New York at levels <200 parts per billion (ppb). Aldicarb residues have since been found in drinking water wells at levels above 10 ppb in other states including Wisconsin, Florida, Maine, Virginia, Connecticut, Delaware, Maryland, New Jersey and Rhode Island. The Agency's Office of Drinking Water has established a Health Advisory Level (HAL) of 10 parts per

billion (ppb) for residues of aldicarb in drinking water. However, since the HAL is derived from the ADI and the ADI may undergo changes in the future, the HAL may be revised. Such a change would likely be an increase in the HAL.

The Pesticide Incident Monitoring System (PIMS) reports on aldicarb from 1966 through 1982, contained 165 incidents associated with human injury, and 6 incidents each involving animals, environmental contamination and non-target plants and crops. Most of the human incidents alleged that aldicarb was the cause of the problem, but there was insufficient evidence to support such a conclusion. Those incidents involving confirmed aldicarb poisonings appeared to be the result of failure to use label recommended safety equipment while applying aldicarb. Other incidents resulted from accidental spillage, ingestion of aldicarb, or consumption of food commodities improperly treated with aldicarb.

4. SUMMARY OF REGULATORY POSITION AND RATIONALE:

In 1982, Union Carbide Corporation voluntarily classified all aldicarb products "Restricted Use" in an effort to minimize further ground water contamination. However, since aldicarb is highly toxic by the oral, dermal and inhalation routes of exposure (Toxicity Category I), the Agency is requiring that all aldicarb products be classified "Restricted Use".

As the result of the aldicarb contamination of drinking water wells, Union Carbide Corporation excluded the use of aldicarb

products in Suffolk County, Long Island, New York. The company also limited the use of aldicarb products on potatoes to once every two years and only after plant emergence in the state of Maine and Wisconsin and the counties of Hartford in Connecticut, Kent and New Castle in Delaware, Franklin and Hampshire in Massachusetts, Worchester in Maryland, Atlantic, Burlington, Cumberland, Monmouth and Salem in New Jersey, Newport and Washington in Rhode Island and Accomack and Northampton in Virginia. Aldicarb may be applied at planting at the 1 lb. active ingredient/acre rate for for aphid control in the state of Maine.

Based on concerns for ground water contamination, product labeling must be further revised to include the following statements:

"This product is usually decomposed into harmless residues. However, a combination of sandy and acidic soil conditions, moderate to heavy irrigation and/or rainfall, use of 3 or more pounds active ingredient per acre, and soil temperature below 50°F at the time of application, tend to reduce degradation and promote movement of residues to ground water. If this describes your local use conditions and ground water in your area is used for drinking, do not use this product without first contacting (company name)."

"Do not apply this product in Del Norte County, California."

"Do not apply more than 5 lbs. active ingredient per acre in the state of Florida."

"Application to citrus fruits in the state of Florida may be made between January 1 and April 30 only."

In the absence of adequate soil dissipation data and dermal exposure data, the Agency is imposing an interm 24-hour re-entery interval.

5. SUMMARY OF MAJOR DATA GAPS

The data requirements represent major data gaps for aldicarb. These data are required to be submitted to the Agency within 4 years from the data of the issuance of the registration document.

- Ruminant metabolism study
- Anaerobic soil metabolism study
- Aerobic and anaerobic aquatic metabolism studies
- Photodegradation in water study
- Soil (field) dissipation study
- Leaching and Adsorption/Desorption Studies
- Volatility study
- Field monitoring data

6. CONTACT PERSON AT EPA

Jay Ellenberger,

Product Manager (PM) 12,

Registration Division (TS-767C),

Office of Pesticide Programs,

Environmental Protection Agency,

401 M St., SW.,

Washington, D.C. 20460.

Office location and telephone number:

Rm. 202, CM #2,

Jefferson Davis Highway,

Arlington, VA 22202,

(703-557-2386).

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